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(54) Enhanced suspension component and method for enhancing the physical characteristics of a suspension component

(57) A method for enhancing the physical characteristics of a localized area of a suspension component (10) by adding material to the points of high stress (H) without a significant increase in weight or diameter of the suspension component. The material is in the form of a sleeve (12) added to the exterior surface (14) of the suspension component, a core (16) added to the interior surface (18) of a tubular suspension component, winding filaments (20), or powered material (22).

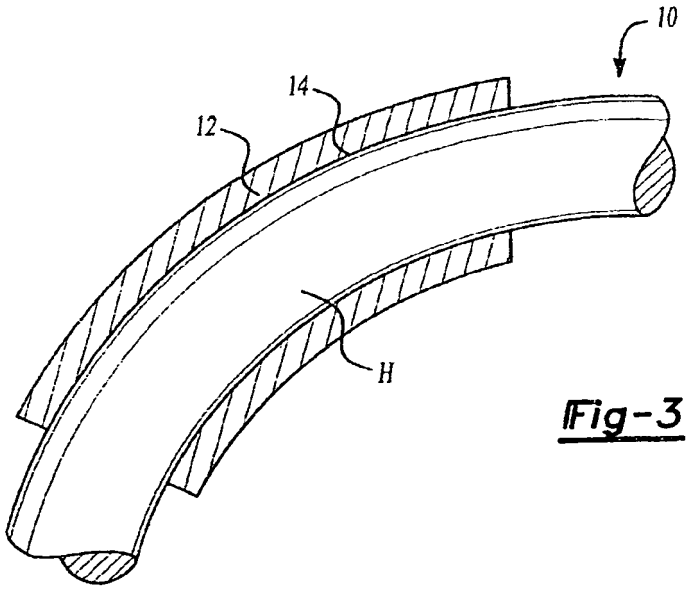

Fig-3

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to a method for enhancing the physical characteristics of a suspension component of a vehicle suspension system and to an enhanced suspension component. More particularly, the present invention relates to a method for enhancing the physical characteristics of a localized area of a suspension component of a vehicle suspension system and to an enhanced suspension component.

[0002] Vehicles are commonly equipped with suspension systems for absorbing road shock and other vibrations, while providing for a smooth and comfortable ride. A suspension component, such as a stabilizer bar, is often used to increase roll rigidity, and control sway as the vehicle turns.

[0003] In order to increase the stiffness of a suspension component, it is often necessary to increase its diameter. However, there are several drawbacks to doing this. For one, increasing the diameter of the suspension component can significantly increase its weight. Additionally, a suspension component of larger diameter may fall outside of machine parameters and be unable to be formed because of its size. In fact, the larger diameter may only be necessary at a localized high stress area.

[0004] Hence, there is a need in the art for a method for enhancing the physical characteristics of a suspension component which does not significantly increase its weight and size.

SUMMARY OF THE INVENTION

[0005] This invention relates to a method for enhancing the physical characteristics of a localized area of a suspension component. Material is selectively added to locations of high stress on the suspension component.

[0006] In a first embodiment of the invention, a sleeve is fitted over the exterior surface of the suspension component (either solid or tubular) at the locations of high stress. A heating/cryogenic technique is used to create an interference fit between the suspension component and the sleeve. The suspension component with the sleeve positioned on its exterior surface is then formed. In the preferred embodiment, the sleeve is made of titanium.

[0007] In another embodiment, a core is inserted into a tubular suspension component either locally at points of high stress or entirely along its length. A heating/cryogenic technique is used to create an interference fit between the core and the tubular suspension component. The suspension component is then formed with the core positioned within the suspension component. In the preferred embodiment, the core is made of a resin type material. The core can also be made of steel.

[0008] In another embodiment, winding filaments of composite material are layered over the suspension component at the points of high stress after the suspension component is formed.

[0009] In another embodiment, powdered material is applied to the suspension component at the points of high stress by spraying or welding techniques. The material can be applied when the suspension component is either formed or unformed.

[0010] In many applications, the high stress areas are at a bend or curve. The added material is preferably added, then the component is heated or curved.

[0011] Accordingly, the present invention provides a method for enhancing the physical characteristics of a localized area of a suspension component.

[0012] These and other features of the present invention will be best understood from the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The various features and advantages of the invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

Figure 1A illustrates a schematic view of a suspension component mounted on a vehicle.

Figure 1B illustrates a schematic view of a formed suspension component of a vehicle suspension system.

Figure 2 illustrates a cross sectional view of an unformed suspension component with sleeves positioned over points of high stress.

Figure 3 is a sectional view of a cross section of a formed suspension component with a sleeve positioned over a point of high stress.

Figure 4 illustrates a cross sectional view of an unformed suspension component with cores positioned at points of high stress.

Figure 5 illustrates a sectional view of a cross section of a formed suspension component with a core positioned at a point of high stress.

Figure 6 illustrates a sectional view of a formed suspension component with winding filaments layered over a point of high stress.

Figure 7 illustrates a sectional view of a formed suspension component with powdered material applied to a point of high stress.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] While the invention may be susceptible to embodiments in different forms, there is shown in the drawings, and herein will be described in detail, specific embodiments with the understanding that the present dis-

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closure is to be considered an exemplification of the principles of the invention, and is not intended to limit the invention to that as illustrated and described herein.

[0015] Figure 1A shows a suspension component 10 on a vehicle 8 mounted between wheels 9. As known, the suspension component 10 provides a stabilizer function. Figure 1B illustrates a schematic view of a formed suspension component 10 of a vehicle suspension system. As shown there are several bends or curves H. These may be high stress areas which could be addressed by the invention. The figure shows a stabilizer bar, but the invention extends to other suspension components.

[0016] Figures 2 and 3 illustrate a first embodiment of the present invention. As shown in Figures 2 and 3, a sleeve 12 is positioned over the exterior surface 14 of an unformed suspension component 10 at points of high stress H to increase the stiffness of the suspension component 10. The suspension component 10 can either be tubular or solid. The sleeve 12 can comprise of any high strength material. In the preferred embodiment, the sleeve 12 is comprised of titanium.

[0017] Next, the use of heat/cryogenic technique is used to create an interference fit between the suspension component 10 and the sleeve 12. This is accomplished by heating the suspension component 10 and cooling the sleeve 12. This technique expands the suspension component 10 and shrinks the sleeve 12, creating an interference fit between the two components. Other interference fit techniques can be used.

[0018] Once the sleeve 12 is positioned and fitted on the exterior surface 14 of the suspension component 10, the suspension component 10 can be formed. As shown in Figure 3, this is accomplished by bending the component 10 at point of high stress H. By positioning the sleeve 12 only over the points of high stress H, the stiffness of the suspension component 10 can be increased without a significant increase in the overall weight and diameter of the suspension component 10.

[0019] Figures 4 and 5 illustrate another embodiment of the present invention. As shown in Figures 4 and 5, a core 16 is inserted into the interior surface 18 of an unformed suspension component 10 at points of high stress H. In this embodiment, the suspension component 10 is tubular.

[0020] In the preferred embodiment, the core 16 is comprised of a resin type material and can be positioned either locally at the areas of high stress H or along the entire length of the suspension component 10. The core 16 can also be comprised of steel. If the core 16 is comprised of steel, the core 16 is preferably positioned only locally at areas of high stress H, rather than along the entire length of the suspension component 10, to reduce weight.

[0021] A heat/cryogenic technique is then used to create an interference fit between the suspension component 10 and the core 16. In this step, the suspension component 10 is heated and the core 16 is cooled. The subsequent expansion of the core 16 and the shrinking of the suspension component 10 creates an interference fit between the two components. The suspension component 10 is then formed with the core 16 positioned inside the suspension component 10 at points of high stress H. Again, other interference fit techniques can be used. As shown in Figure 5, the component 10 is then bent to form area H.

[0022] In another embodiment, as shown in Figure 6, winding filaments 20 of composite material are layered over the exterior surface 14 of the suspension component 10 at areas of high stress H. The winding filaments 20 are layered over the suspension component 10 after it has been formed. Filaments 20 can be an appropriately selected high strength material. As an example, appropriate glass fibers and plastic composites may be used.

[0023] Figure 7 illustrates another embodiment of the present invention. In this embodiment, powdered material 22 is applied by a spraying or welding technique to the exterior surface 14 of the suspension component 10 at locations of high stress H. The powdered material 22 can be applied either before or after the suspension component 10 has been formed. As with the prior embodiments discussed above, by applying the powered material 22 only to locations of high stress H, the weight and diameter of the suspension component 10 can be significantly reduced. Again, appropriate material for coating will be selected.

[0024] Once additional or different materials are added to the locations of high stress H of the suspension component 10, the novel advantages of this invention will become apparent. For one, by selectively adding different materials to the suspension component 10 at only the locations of high stress H, the stiffness of the suspension component 10 can be increased at the desired locations without a substantial increase in the overall weight and diameter. This can be accomplished because the additional material is added only to the areas of high stress H, rather than to the entire length of the suspension component 10. Additionally, because the overall diameter of the suspension component 10 is not increased, the suspension component 10 will still fall within machine parameters, allowing the suspension component 10 to be formed.

[0025] Accordingly, the present invention provides a method for enhancing the physical characteristics of a localized area of a suspension component 10 by adding material to the points of high stress H, without a significant increase in the weight and diameter of the suspension component 10. The invention also allows the suspension manufactures to simply and inexpensively manufacture a variant component such as for low protection runs. As an example, a standard component could be designed. A simple modification of the basic component by this invention allows the component to be tailored to a "sport" or high stress application.

[0026] The foregoing description is exemplary rather

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then defined by the limitations within. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, so that one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specially described. For that reason the following claims should be studied to determine the true scope and content of this invention.

Claims

1. A method for enhancing the physical characteristics of a suspension component (10) of a vehicle suspension system, said suspension component having an exterior surface (14), comprising the step of:

   selectively adding a material to said suspension component at locations of high stress (H).

2. The method as recited in claim 1 further comprising the step of forming said suspension component after selectively adding said material to said suspension component at locations of high stress.

3. The method as recited in claim 2 wherein said material is an outer sleeve (12) added over said exterior surface of said suspension component at locations of high stress.

4. The method as recited in claim 3 further comprising the step of fitting said outer sleeve over said exterior surface of said suspension component and then interference fitting said sleeve on said suspension component.

5. The method as recited in claim 2 wherein said suspension component further comprises an interior surface (18), and said material is an inner core (16) added into said interior surface of said suspension component at locations of high stress.

6. The method as recited in claim 5 further comprising the step of fitting said inner core into said interior surface of said suspension component and then interference fitting said core in said suspension component.

7. The method of claim 5 or claim 6 wherein said core is placed at several spaced locations.

8. The method as recited in claim 1 further comprising the step of forming said suspension component before selectively adding said material to said suspension component at locations of high stress.

9. The method as recited in claim 2 or claim 8 wherein said material is powdered (22) and applied to said exterior surface or said suspension component at locations of high stress.

10. The method as recited in claim 8 wherein said material is winding filaments (20) and layered over said exterior surface of said suspension component at locations of high stress.

11. An enhanced suspension component (10) of a vehicle suspension system comprising:

    a suspension component having an exterior surface; and
    an added material at localized areas whereby said material is selectively added to said suspension component at locations of high stress.

12. The enhanced suspension component as recited in claim 11 wherein said added material is an outer sleeve (12) fitted over said exterior surface of said suspension component.

13. The enhanced suspension component as recited in claim 12 wherein said outer sleeve is comprised of titanium.

14. The enhanced suspension component as recited in claim 11 wherein said suspension component is tubular and further comprises an interior surface (18), and said added material is an inner core (16) fitted in said interior surface of said suspension component.

15. The enhanced suspension component as recited in claim 14 wherein said inner core is comprised of a resin type material.

16. The enhanced suspension component as recited in claim 14 wherein said inner core is comprised of steel.

17. The enhanced suspension component as recited in claim 11 wherein said added material is powdered (20) and applied over said exterior surface of said suspension component.

18. The enhanced suspension component as recited in claim 12 wherein said added material is winding filaments (20) and layered over said exterior surface of said suspension component.

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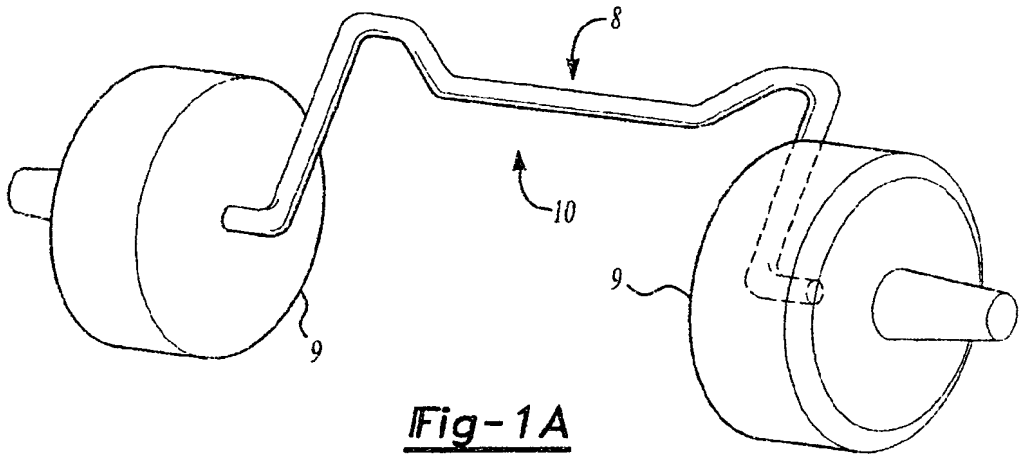

Fig-1A

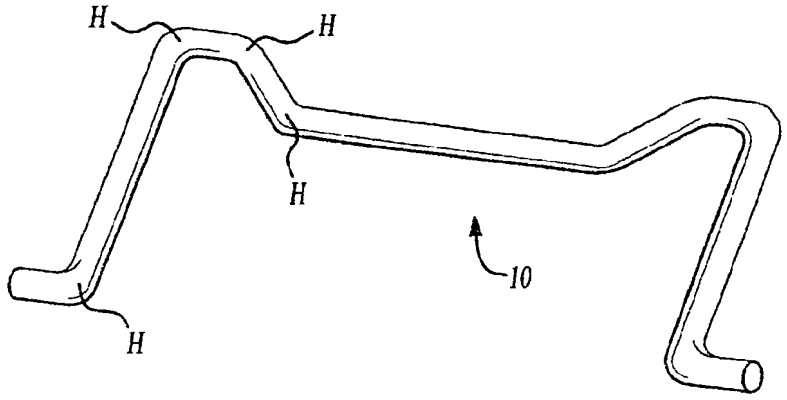

Fig-1B

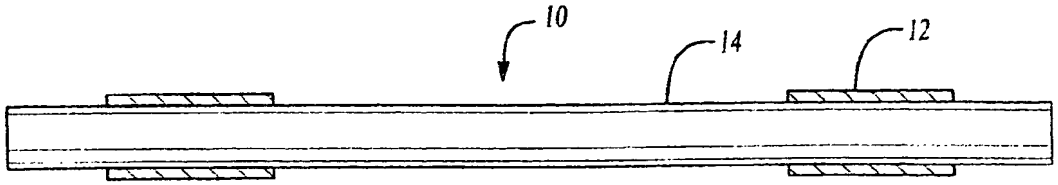

Fig-2

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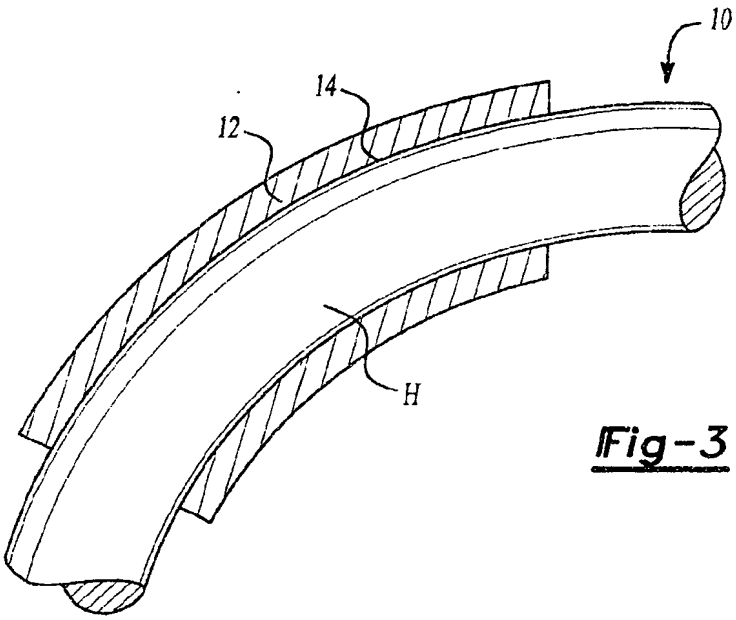

Fig-3

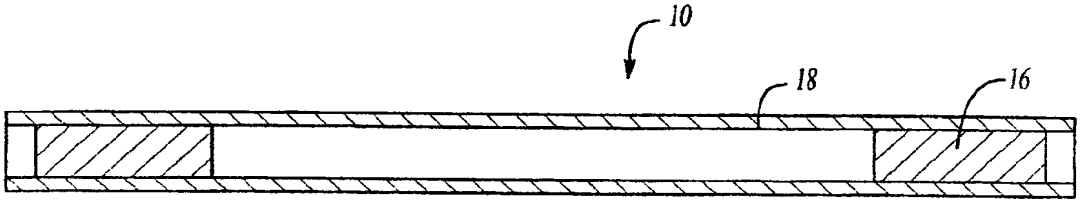

Fig-4

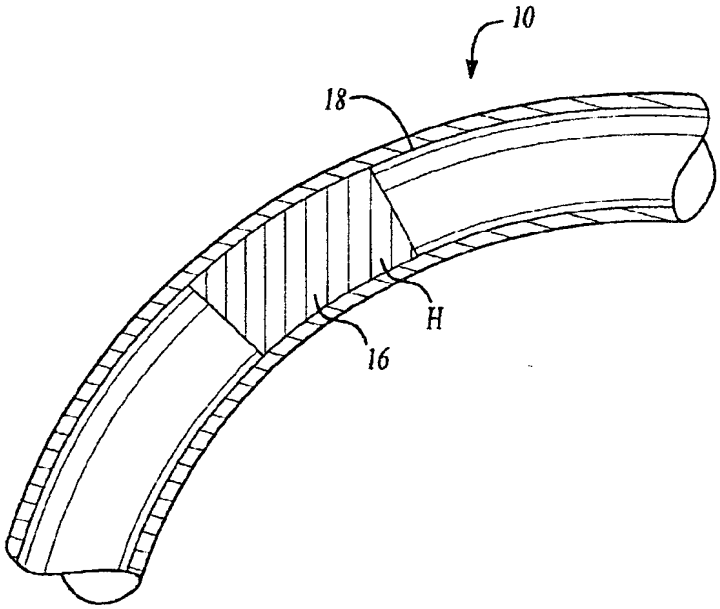

Fig-5

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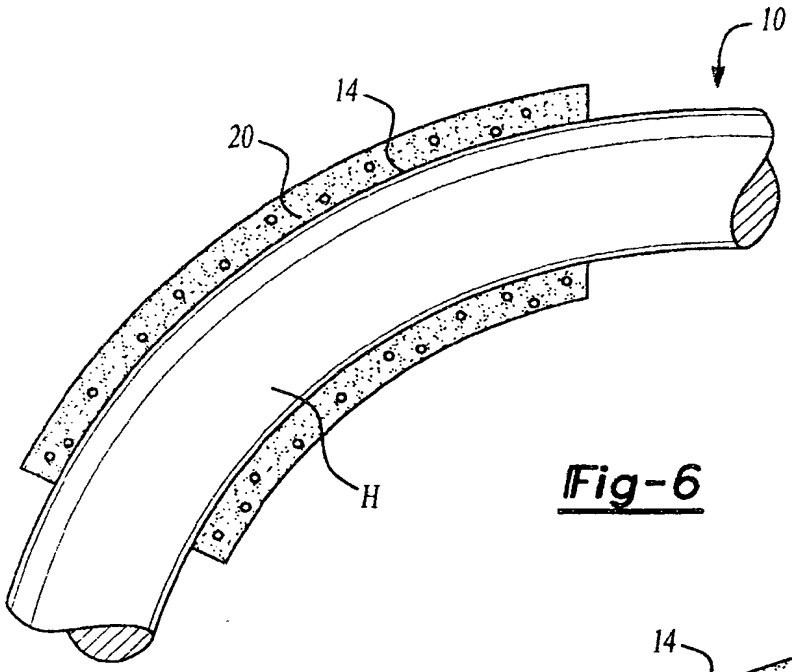

Fig-6

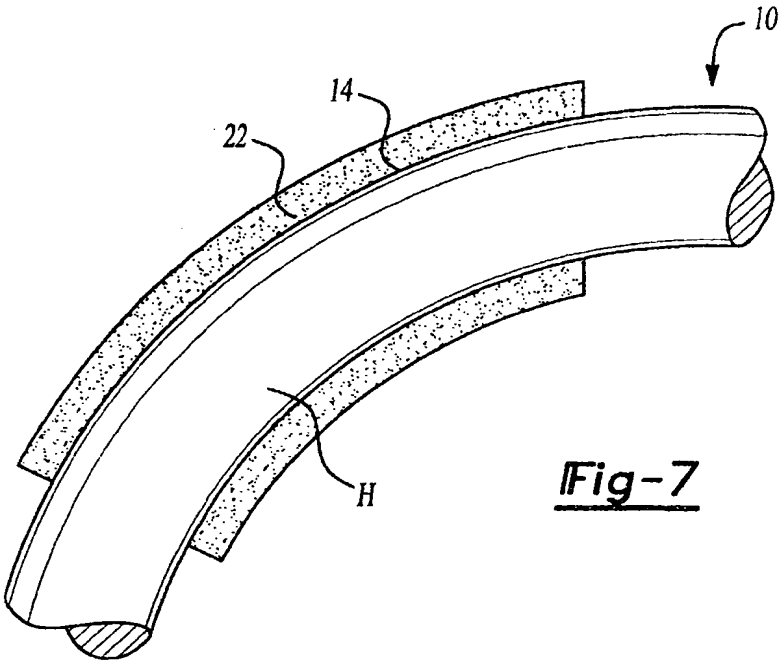

Fig-7

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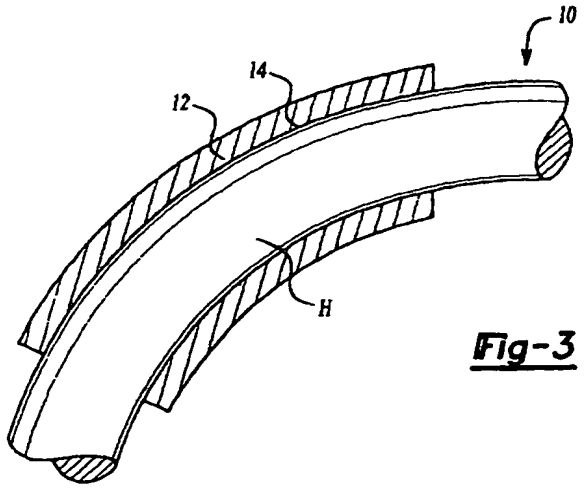

Fig-3

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 30 9393

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 069 945 A (HOESCH WERKE AG) 3 September 1981 (1981-09-03) * page 1, line 87 - line 101; figure 1 *	1,2,5-7, 11,14,16	B60G7/00 B60G21/055
X Y	FR 2 521 919 A (ALLEVARD IND SA) 26 August 1983 (1983-08-26) * page 2, line 23 - line 28; figure * * page 1, line 30 *	1,3,11, 12 9,17	
Y	US 5 588 209 A (FERDANI PHILIP ET AL) 31 December 1996 (1996-12-31) * column 5, line 16 - line 27 * * column 6, line 13 - line 21 *	9,17	
X	FR 2 531 014 A (ALLEVARD IND SA) 3 February 1984 (1984-02-03) * page 2, line 8 - line 11 * * page 3, line 20 - line 27 *	1,3,4,8, 10-13,18	
X A	DE 41 16 837 A (HOESCH AG) 26 March 1992 (1992-03-26) * column 1, line 64 - column 2, line 11; figure *	1,5-9, 11,14, 15, 17	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B60G
X	EP 0 960 753 A (BENTELER WERKE AG) 1 December 1999 (1999-12-01) * paragraph '0013! - paragraph '0021! *	1,5-9, 11,14,15	
X A	EP 0 391 222 A (BOEHLER AG) 10 October 1990 (1990-10-10) * column 7, line 19 - line 37; figure 5 *	1,3,8, 10-12,18 14	
A	DE 90 06 777 U (VEREINIGTE ALUMINIUM-WERKE) 23 August 1990 (1990-08-23) * page 3, paragraph 5 - page 4, paragraph 1 *	13	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 April 2004	Torsius, A

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

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EP 01 30 9393

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 297 04 863 U (INNENHOCHDRUCKVERFAHREN MBH &) 22 May 1997 (1997-05-22) * page 2, paragraph 2 - paragraph 3 *	13	
X	US 4 138 141 A (ANDERSEN GEORGE L) 6 February 1979 (1979-02-06) * figures *	1-7,11, 12,14,16	
A	DE 197 38 249 A (DAIMLER BENZ AG) 11 March 1999 (1999-03-11) * column 1, line 58 - line 60 *	1,11	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

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The Hague	15 April 2004	Torsius, A

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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15-04-2004

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
GB 2069945	A	03-09-1981	DE	2846445 A1	30-04-1980
			FR	2476781 A1	28-08-1981
FR 2521919	A	26-08-1983	FR	2521919 A1	26-08-1983
			FR	2531014 A2	03-02-1984
US 5588209	A	31-12-1996	NONE		
FR 2531014	A	03-02-1984	FR	2521919 A1	26-08-1983
			FR	2531014 A2	03-02-1984
DE 4116837	A	26-03-1992	DE	4116837 A1	26-03-1992
EP 0960753	A	01-12-1999	DE	29809241 U1	27-08-1998
			BR	9902102 A	08-02-2000
			CZ	9901849 A3	15-12-1999
			EP	0960753 A2	01-12-1999
			US	6510763 B1	28-01-2003
EP 0391222	A	10-10-1990	DE	3910641 A1	18-10-1990
			EP	0391222 A1	10-10-1990
DE 9006777	U	23-08-1990	DE	9006777 U1	23-08-1990
DE 29704863	U	22-05-1997	DE	29704863 U1	22-05-1997
			BR	9811653 A	19-09-2000
			CA	2285464 A1	24-09-1998
			WO	9841412 A1	24-09-1998
			EP	0968095 A1	05-01-2000
			US	6471226 B1	29-10-2002
US 4138141	A	06-02-1979	CA	1100536 A1	05-05-1981
DE 19738249	A	11-03-1999	DE	19738249 A1	11-03-1999
			DE	59808739 D1	24-07-2003
			EP	0900675 A2	10-03-1999
			US	6152433 A	28-11-2000

EPO FORM P0459

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